FINAL REPORT:

A Theoretical and Observational Study of Large- and Small-Scale Dynamics in the Mesosphere and Lower Thermosphere in Support of TIMED

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1. TIMED Mission and Science

The TIMED (Thermosphere-Ionosphere-Mesosphere Energetics and Dynamics) mission was conceived to perform the first focussed study of the atmosphere between $\sim$ 60 and 180 km using two satellites and state-of-the-art instrumentation. Instrument team and IDS selections provided a spectrum of nine instruments from which the Science Working Group was to define instrument complements for two spacecraft. High and low inclinations were selected in order to provide both global coverage for definition of the mean state and faster precession for sensitivity to variations in forcing at less than seasonal time scales. TIMED science was defined to include the energetics, dynamics, radiation, and chemistry that act to control the structure and variability of this region and its coupling to higher and lower levels of the atmosphere.

2. TIMED Mission and Science Descope

Unfortunately, the TIMED mission as defined was judged to be far too expensive given the current NASA funding environment. Thus the SWG was tasked with reducing both the science scope and the cost of the mission. This was accomplished at considerable pain and effort via a series of meetings. Initially, we sought to maintain sensitivity to the broadest science goals, keeping a two-spacecraft design and limiting the instruments on each. Ultimately, however, costs drove us to a single spacecraft with various competing subsets of the TIMED science motivating various subsets of the nine initial instruments. The decision between the various options was made by an external review panel. Subsequent to that decision, the surviving SWG instrument teams and IDS's have sought to configure the instruments and spacecraft in a manner that would maximize the potential science within the context of the mission descope. The PI of this research grant played a large role in this effort by insuring instrument measurement capabilities that would retain as much sensitivity to dynamical variations and inputs as possible.